



Charles Schelz / Biologist

ARCHES NATIONAL PARK

RESEARCH PROJECTS 2004

Information about research projects at Arches National Park and other parks can be found on the internet via <http://science.nature.nps.gov/research>.

1) THE MOAB SITE ENVIRONMENTAL AIR MONITORING PROGRAM – CONDUCTED BY THE U.S. DEPARTMENT OF ENERGY'S GRAND JUNCTION OFFICE

Investigator: Joel Berwick, U. S. Department of Energy

The U.S. Department of Energy (DOE) Grand Junction Office took custody of the former Atlas uranium mill site in Moab, UT on October 25, 2001. As part of DOE's overall environmental monitoring strategy, a network of air samplers have been installed near the former mill site and at various locations throughout the surrounding community for the purposes of determining compliance with various DOE Orders, and applicable federal and state air quality regulations. DOE's environmental air monitoring program monitors location-specific and background air quality for concentrations of radio-particulate matter (i.e., U-nat, Po-210, Ra-226, and Th-230), atmospheric radon-222 emissions, environmental gamma radiation, and opacity (i.e., fugitive dust emissions).

Permit ID: ARCH-2004-SCI-0001 **Study ID:** ARCH-00013 **Application Id:** 18275

Start Date: Jan 01, 2004, **Expiration Date:** Dec 31, 2004

2) BIOLOGY AND DISTRIBUTION OF THE BUTTERFLIES OF ARCHES AND CANYONLANDS NATIONAL PARKS

Investigator: Clyde Gillette, Utah Lepidopterists Society

The purpose of this project is to create an Expanded Checklist of the Butterflies of Arches and Canyonlands National Parks which will include distribution in space and time, documented larval food plants, limited developmental histories, and some behavioral traits. Some information on plants will be included, but only as required to emphasize the butterflies' life history.

Permit ID: ARCH-2004-SCI-0002 **Study ID:** ARCH-00011 **Application Id:** 18058

Start Date: Mar 01, 2004, **Expiration Date:** Dec 31, 2004

3) BCS PROJECT / BARRIER CANYON STYLE ROCK ART DOCUMENTATION.

Investigator: David Sucec, BCS PROJECT

The objectives of the BCS PROJECT documentation project are to record all Barrier Canyon style rock art images with archival photographic prints (gelatin-silver and ultra-stable color prints), to create a complete inventory of the documented sites, and to generate a scholarly description and analysis of the imagery.

Permit ID: ARCH-2004-SCI-0003 Study ID: ARCH-00017 Application Id: 18052

Start Date: Feb 01, 2004, Expiration Date: Dec 31, 2004

4) ACOUSTIC MONITORING IN ARCHES NATIONAL PARK

Investigator: Skip Ambrose, National Park Service

The primary objective of this project is to provide basic acoustic data necessary for preparation of air tour management plans for ARCH. A secondary objective is to collect acoustic data that will be useful in preparing a soundscape management plan. Specifically, these data include:

1. Natural sound levels in the primary habitats/acoustic zones in ARCH during all seasons of the year; and
2. The influence of aircraft and other man-made noise on natural sound levels.

Permit ID: ARCH-2004-SCI-0004 Study ID: ARCH-00012 Application Id: 18350

Start Date: Feb 06, 2004, Expiration Date: Dec 31, 2004

5) CARBON AND NITROGEN CYCLES IN ARID LANDS: THE ROLE OF BIOLOGICAL SOIL CRUSTS AS INFLUENCED BY SOIL SURFACE DISTURBANCE, CLIMATE CHANGE AND ANNUAL GRASS INVASION

Investigator: Jayne Belnap, USGS, Moab Field station

This project will establish how alterations in species composition by surface disturbance, invasive grasses, and/or climate change may affect N and C inputs and fluxes, in different soils under different climatic regimes. Because current and expected changes in land use and climate will occur over millions of acres in western rangelands, impacts to soil crusts have the potential for dramatically affecting C cycles, N cycles, and vascular plant productivity over much of the western United States. In addition, semi-arid and arid ecosystems represent over one-third of the Earth's terrestrial surface, and most are covered by biological soil crusts. As human impacts are escalating both regionally and globally in these drier regions, the research questions posed in this proposal have significant implications for global C budgets as well.

Permit ID: ARCH-2004-SCI-0005 Study ID: ARCH-00008 Application Id: 18360

Start Date: Feb 15, 2004, Expiration Date: Dec 31, 2004

6) ANNUAL FOREST LAND INVENTORY OF UTAH

Investigator: Michael J. Wilson, USDA Forest Service, Rocky Mountain Research Station

The Interior West Forest Inventory and Analysis Program of the Rocky Mountain Research Station is currently conducting its annual statewide forest land inventory in [Utah](#). The Program is responsible for conducting statewide inventories in eight States in the Interior West in cooperation with the State and other Federal Government agencies. Each field plot is visited every 5 to 10 years, and 10 percent (a panel) of the total plots within a State are visited each year. The purpose of this inventory is to gather information on quantity and quality of forest resources, growth, removals, availability of wood products for the future, and forest health.

Permit ID: ARCH-2004-SCI-0006 Study ID: ARCH-00002 Application Id: 18422

Start Date: Feb 11, 2004, Expiration Date: Dec 31, 2004

7) VEGETATION DATA COLLECTION IN SUPPORT OF THE U.S. GEOLOGICAL SURVEY - NATIONAL PARK SERVICE VEGETATION CLASSIFICATION AND MAPPING PROGRAM AT ARCHES NATIONAL PARK

Investigator: James Von Loh, Engineering-Environmental Management, Inc

The National Park Service (NPS) and U.S. Geological Survey (USGS) are cooperating to produce detailed vegetation classifications and digital databases, including vegetation maps, as part of the National Biological Information Infrastructure Program (NBII). Approximately 250 national parks and monuments will benefit from this cooperative effort upon successful program completion. The National Park Vegetation Classification and Mapping Program is a strong component of the NPS Inventory and Monitoring Program, established in 1991, and is based on a repeatable set of standards and flexible protocols.

Permit ID: ARCH-2004-SCI-0007 Study ID: ARCH-00016 Application Id: 18685

Start Date: Feb 24, 2004, Expiration Date: Dec 31, 2004

8) A STUDY OF THE DISTRIBUTION OF CATOCALA BENJAMINI AND RELATED CATOCALA IN NORTHEASTERN ARIZONA AND SOUTHEASTERN UTAH.

Investigator: John Peacock, Private Investigator

The distribution of *Catocala benjamini* (Lepidoptera: Noctuidae) is limited to four southwestern states: California, Nevada, Arizona and Utah. There are presently three recognized subspecies: *C. benjamini benjamini* (all four states), *C. benjamini mayhewi* (southern CA) and *C. benjamini jumpi* (Kofa Mtns., AZ). On 6 June 1994, Dr. Paul Opler collected a "form" of *benjamini* at Canyonlands National Park that is unlike any *benjamini* yet described. The purpose of the proposed research is to evaluate the distribution of *C. benjamini* and related *Catocala* in northeastern AZ and southeastern UT to determine if this new "form" merits subspecies status.

Permit ID: ARCH-2004-SCI-0009 Study ID: ARCH-00009 Application Id: 18804 Start Date: Apr 01, 2004, Expiration Date: Dec 31, 2004

9) DEFORMATION OF POROUS SANDSTONE

Investigator: Jonny Hesthammer, University of Bergen, Norway

The purpose of the study is to understand how deformation structures in porous sandstones affect fluid flow. The University of Bergen, Norway, carries out extensive research related to deformation in porous sandstones in order to understand how such structures affect fluid flow. Over the past several years, a number of M.Sc. and PhD students at the Department of Earth Sciences have worked with relevant field areas in SE Utah. The department has recently engaged a PhD-student (Atle Rotevatn) who will study relay structures. These are faults that overlap horizontally. Faults in porous sandstones are associated with shear (deformation) bands. Our present understanding of the spatial geometries of shear bands within relay structures is not well understood.

Permit ID: ARCH-2004-SCI-0010 Study ID: ARCH-00027 Application Id: 19735 Start Date: May 01, 2004, Expiration Date: Dec 31, 2004

10) FACTORS INFLUENCING DISTRIBUTION & MORTALITY OF A DOMINANT RIPARIAN TREE

Investigator: Alicyn Gitlin, Northern Arizona University

This study aims to identify some of the factors which are acting as agents of selection on Fremont cottonwoods, and to determine whether certain genetic-based traits (e.g., increased tolerance to water stress) might enhance tolerance to drought, salinity, exotics and/or altered river management. Utilizing surveys of natural stands of cottonwood, invaded and non-invaded by tamarisk, and experimental removal plots, we propose to address the following questions: 1) Are the surviving cottonwoods in tamarisk dominated riparian forests better adapted to survive drought and/or salinity stress than cottonwoods in cottonwood stands without tamarisk? 2) Does eradication of tamarisk create conditions more favorable to cottonwood survival and reproduction? Here we will evaluate 10 tamarisk removal studies to quantify the performance of the surviving cottonwoods. There may be a

“target level” of tamarisk that can be allowed which is consistent with cottonwood sustainability. Alternatively even low levels of tamarix negatively affect cottonwoods and it must be completely eliminated to permit cottonwood regeneration and survival. Based on our preliminary studies, we suspect that even at densities as low as 10% tamarisk cover, pronounced negative impacts on cottonwoods occur. 3) How does the survival of the F₁ hybrid of Fremont cottonwood and narrowleaf cottonwood (*Populus fremontii* x *P. angustifolia*) compare with its parent species during drought and can these natural hybrids be used for habitat restoration? Preliminary monitoring suggests that naturally occurring F₁ hybrids exhibit superior drought tolerance to their parental species
Permit ID: ARCH-2004-SCI-0011 Study ID: ARCH-00026 Application Id: 20857 Start Date: Jul 01, 2004, Expiration Date: Dec 31, 2004

11) SPATIAL ARRANGEMENT OF DEFORMATION BANDS IN THE MOAB MEMBER OF THE ENTRADA SANDSTONE

Investigator: Randall Marrett, University of Texas, Austin

The goal of the project is to quantify the arrangement in space of deformation bands, which are a special type of fault that forms in sandstones having high porosity at the time of deformation. Deformation bands are common in the Entrada Formation throughout Arches National Park, typically showing a braided pattern of mm- to cm-scale ridges protruding above the level of slickrock exposures.

Permit ID: ARCH-2004-SCI-0012 Study ID: ARCH-00028 Application Id: 21068 Start Date: Jul 22, 2004, Expiration Date: Dec 31, 2004

12) RECORDING BARRIER CANYON STYLE ROCK ART

Investigator: Michael Firnhaber, University College London, London, United Kingdom

The proposed fieldwork involves the non-intrusive recording of Barrier Canyon Style rock art for the purpose of study and interpretation. The research based upon the proposed fieldwork will result primarily in a PhD dissertation; the applicant, Michael Firnhaber, is enrolled in the Department of Anthropology at the University College London, London, United Kingdom.

Permit ID: ARCH-2004-SCI-0013 Study ID: ARCH-00029 Application Id: 20772 Start Date: Aug 01, 2004, Expiration Date: Dec 31, 2004

13) USING BIOTECHNOLOGY TO RESTORE RIPARIAN HABITATS IN THE WEST: GENETIC AND GENOMIC STUDIES OF BIODIVERSITY AND DROUGHT TOLERANCE

Investigator: Gery Allan, Northern Arizona University

This study examines the link between the genetic diversity of a dominant riparian tree and biodiversity in riparian ecosystems.

Permit ID: ARCH-2004-SCI-0014 Study ID: ARCH-00030 Application Id: 21423 Start Date: Sep 01, 2004, Expiration Date: Dec 31, 2004